Introduction

1.1 Background

Over the forty years since its origin in the papers by Treynor (1961), Sharpe (1964), Lintner (1965) and Mossin (1966), the standard capital asset pricing model (CAPM) has occupied a prominent position in financial economics as a most acceptable paradigm for determining the theoretically appropriate expected rate of return on any risky asset. Given certain simplifying assumptions, the model states that the expected rate of return on any security is positively and linearly related to its systematic risk ($\beta$) measured relative to the market portfolio of all marketable securities. Hence, according to the CAPM, the expected return $E(R_i)$ on security $i$ can be expressed in terms of its relationship with its systematic risk $\beta_i$ as:

$$E(R_i) = R_f + \beta_i [E(R_m) - R_f]$$  \hspace{1cm} (1.1)

where,

- $E(R_i)$ is the expected return on the capital asset
- $R_f$ is the risk-free rate of interest
- $\beta_i$ represents the systematic risk of the asset measured as sensitivity of the asset returns to market returns,
- $E(R_m)$ is the expected return of the market

However, security analysts, institutional investors, fund managers and other market players are persistently involved in searching for the trading strategies that can outperform the market and hence provide extra-normal returns, i.e. the returns in excess of expected return on a security. These
trading strategies, designed to earn superior returns, attempt to gain from stock market inefficiencies. Such an attempt by market practitioners represents a challenge to the hitherto dominant paradigm in the financial market research, that is, Efficient Market Hypothesis (EMH). Efficient Market Hypothesis asserts that the price of a security efficiently reflects all the information that is available to the public and that it is not possible for anyone to consistently outperform others and earn superior returns by using the information which is already reflected in security prices.

Since 1960’s, EMH has been a subject of considerable interest to financial economists, with most of the financial market research centered on the question of whether the security prices are predictable or the markets are efficient. Initially, during sixties and seventies, it was virtually taken for granted that the stock markets are efficient as majority of the evidence accumulated in the favour of EMH. Many early empirical studies confirmed the unpredictability of stock prices, thus suggesting that the stock markets were efficient and that it is not possible for an investor to devise a trading strategy which can earn above-normal returns. However, during eighties and nineties, as more and more researchers investigated the efficiency of stock markets, some rather controversial evidence began to appear, thus marking the phase of more cautioned and critical approach towards EMH. Studies evidenced that stock prices are indeed predictable.

The EMH became controversial especially after the detection of certain anomalies in the capital markets which are difficult to reconcile with the concept of efficient markets. Various studies reported time patterns in security returns and documented the “Monday Effect”, “January Effect”, “Holiday Effect” etc, while many others found a significant relationship
between excess returns and number of firm characteristics such as size, market to book ratio, earnings to price ratio etc.¹

Consequently, the intellectual dominance of the efficient market hypothesis became far less universal. Researchers even started exploring the possibility of return predictability on the basis of prior period stock price behaviour. By the end of 1980’s, an extensive body of literature has emerged which demonstrates the predictive ability of security’s prior period prices in explaining their subsequent return behaviour, both over the short-run as well as over the longer horizon. De Bondt and Thaler (1985), for the first time formally presented an evidence of significant reversals observed in the direction of stock returns measured over a period of three-to-five years in the U.S. stock market. They demonstrated significant changes in the direction of returns, over long period of three to five years and attributed their findings to the presence of ‘Overreaction Effect’ in the stock market. They found that the stocks which experienced extremely negative returns during the past three or five years outperformed the stocks which experienced extremely positive returns during the same period of three or five years. On the other hand, when the returns are measured over intermediate horizon of few months, various studies have found the existence of some positive serial correlation between successive stock price changes whereby stock returns have been observed to follow a continuation pattern. Jegadeesh and Titman (1993) and others demonstrated that stocks experiencing high returns over the past three to twelve months continue to perform better in future than the stocks with low short term past returns for the U.S. market. Studies often attributed this return continuation to the presence of ‘Momentum Effect’ in stock returns, thus indicating that stocks with prior short-term positive returns will continue to earn positive returns in near future and vice-versa. More recently, several studies namely Howe (1986), Bremer and Sweeney (1988), Pritamani and

¹ For a more detailed note on evolution of research on EMH, refer to Chapter 2 of this study.
Singal (2001), Larson and Madura (2003) and others have also documented reversals and continuations in the direction of security returns measured over very short intervals of few days.

Following these findings, a lot of empirical research has been conducted to re-investigate the evidence on the predictive ability of the past returns in explaining the cross-sectional behaviour of subsequent stock returns. Additionally, a lot of research effort has also been devoted to explore the possible reason behind the existence of such predictability. While one of the explanations that have been advanced behind it is based on the behavioural biases on the part of market participants to overreact or underreact to previous large price changes. Alternatively, the other explanation is based on the response of the market participants to the changing risk accompanying extreme price changes. Yet another line of explanation argues that market microstructure effects, namely bid-ask bounce effect and infrequent trading, contributes to the observed predictable patterns in security prices.

With more and more research effort concentrated in the area of investigating the predictability of security returns based on their past prices, there emerged an extensive body of literature documenting the “Prior Return Effect”. Initially, however, most of the research in the area of prior return effect was concentrated towards U.S. stock market with most of the early tests based on U.S. stock market data. But, with the increasing popularity and recognition of the overreaction and the momentum effects in U.S. stock returns, its investigation started internationally. Various studies have tested and documented the winner-loser patterns in stock returns for many other stock markets worldwide including those of U.K., Japan, France, Germany, Brazil, Russia, Turkey etc.

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2 The alternative explanations are discussed in detail in Chapter 2 of this study.
1.2 Rationale of the study

Universal applicability of any stock market phenomenon necessitates its investigation both for the developed, mature capital markets as well as for the developing and emerging capital markets of the world. This is because of the fact that different capital markets differ from each other in terms of several aspects such as institutional structures, cultural backgrounds etc. and as is documented by social psychology literature (Barberis, Shleifer and Vishny (1998), Daniel, Hirshleifer and Subrahmanyam (1998), Hong and Stein (1999) etc.), the institutional structures and cultural backgrounds may influence investor behaviour. Consequently, a stock market phenomenon which may be found to exist in developed capital markets may not be found to exist in developing and emerging capital markets of the world. The prior-return effect, which is well documented for U.S. and other more matured stock markets, has not yet been probed well for the emerging capital markets of the world as there exists very inadequate evidence of the presence or the absence of the overreaction effect and the momentum effect in these markets which can contribute towards the literature documenting the prior-return effect or to develop an explanation to the previous findings of U.S. and other international markets. As also, differences in the development level of markets and market structures provide unique opportunity to examine the validity of this well documented phenomena and hypothesis worldwide.

Also, with the opportunities of intra-day trading increasingly being available to investors, it becomes all the more desirable to investigate the applicability of this well documented effect using high frequency data, i.e. the intra-day stock price data observed over very short intervals of few minutes or hours within a trading day. However, majority of studies in this line of research have based their investigation on monthly or the daily returns data of the sample stocks. Hence there is a felt need to investigate the existence of winner-loser patterns in the stock returns measured over very short intervals
of few minutes or hours within a trading day. As there is no or very little work published on the investigation of prior return effect using high frequency data especially in the context of the emerging capital markets which continuously strive to move towards greater market efficiency, the present study attempts to fill this vacuum by investigating the applicability of prior-return effect using high frequency data in the Indian capital market which is at present, one of the leading emerging capital markets of the world. More specifically, the present study attempts to examine the behaviour of the stock returns following extreme daily price changes as well as extreme intra-day price changes over very short intervals of thirty minutes during trading hours in a day, for the stocks listed on S&P CNX 500 Equity index of National Stock Exchange (NSE) which is the largest stock exchange of India.

The purpose of this study is threefold; firstly to investigate the evidence of prior return effect in the cross-section data of daily and intra-day returns of Indian stocks, secondly to investigate whether the observed behaviour of security returns subsequent to extreme price changes is captured by the risk related explanation based on size effect, or alternatively it is another manifestation of value effect\(^3\) or it is a phenomenon distinct from it, and thirdly to test whether it is possible to devise a trading strategy, based on the observed market behaviour following price shocks, which can beat the market on consistent basis.

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\(^3\) Value effect simply implies that out of favor value stocks outperforms glamour stocks. Value stocks are the stocks which are underpriced/undervalued and remained out of favor because they have performed poorly in the past and are expected to continue to perform poorly while glamour stocks are the overvalued stocks which have performed well in the past and are expected by the market to perform well in the future. Value effect postulates that value strategies which calls for buying value stocks produces superior returns because these strategies are contrarian to “naïve” strategies followed by other investors who extrapolate past performance too far into the future and thus produce higher returns. Thus, value effect and the overreaction effect both seems to capture the similar sub-optimal behaviour of typical investors.
1.3 Indian Securities Market – An overview

The working of stock exchanges in India started in 1875 with the setup of Bombay Stock Exchange (BSE), the oldest stock exchange of India. However, it picked up momentum only during the early 1990’s with the creation and empowerment of the stock market regulator SEBI (Securities Exchange Board of India) along with the adoption of sophisticated information technology tools in trading and settlement mechanisms. Over just one decade of 1990’s, Indian securities market has witnessed a radical transformation from a dull to an emerging market in International arena. Introduction of screen-based trading, shortening of settlement cycles, dematerialization of securities, clearing corporation, derivative instruments, etc. have all changed the very character of the Indian stock market. Improved market surveillance, trading mechanisms and the introduction of new financial instruments have made it a center of attraction for even the international investors. Better fundamentals – higher economic growth, more macro stability, structural reforms and specific policy changes along with the entry of Foreign Institutional Investors (FIIs) and the spectacular growth of the mutual fund industry have further added to the depth and width of the Indian stock market. With 19 organised stock exchanges, more than 5,100 listed companies and above 10,268 registered trading members, market capitalisation of about Rs. 62,191 billion and the trading volume of about Rs. 34,843 billion by the end of March 2012, Indian stock market have stood out in the world ranking and is also considered to be way ahead of many developed countries’ capital market.\(^4\) There is a move towards greater transparency and market efficiency.

capital markets of the world. As also, the stock market anomaly in question, i.e. the prior-return effect, represents a potential anomaly to the weak form of market efficiency and thus makes its investigation further interesting in case of the Indian stock market which is being recognized as one of the efficient capital markets.

1.4 Objectives of the study

Primary objective of our study is to investigate the presence (or absence) of “Prior-Return Effect” in Indian Stock Market using daily as well as intra-day share price data. This objective is sought to be achieved through the following sub-objectives:

1. To test whether the securities experiencing extreme price rises (prior winners) and declines (prior losers) respectively from one trading day to another trading day exhibit any predictable patterns in their subsequent holding period returns.

2. To test whether the patterns exhibited by security returns following extreme one-day price changes are explained by firm’s size, as implied by risk related explanation based on size effect, or is a distinct phenomenon.

3. To test whether the patterns exhibited by security returns following extreme one-day price changes are another manifestation of Value effect or a phenomenon distinct from it.

4. To test whether the securities experiencing extreme price rises (prior winners) and declines (prior losers) respectively within a trading day exhibit any predictable patterns in their subsequent holding period returns.
5. To test whether the patterns exhibited by security returns following extreme intra-day price changes are explained by firm’s size, as implied by risk related explanation based on size effect, or is a distinct phenomenon.

6. To test whether the patterns exhibited by security returns following extreme intra-day price changes are another manifestation of Value effect or a phenomenon distinct from it.

7. To test whether an investment strategy can be designed which can generate superior returns based on the patterns observed in the cross-sectional behaviour of security prices following extreme daily and intra-day price changes.

1.5 Testable Hypothesis

The study seeks to achieve the above mentioned objectives by testing the following hypotheses:

1. Prior winners display predictable patterns in their returns on days following extreme price changes from one trading day to another trading day.

2. Prior Losers display predictable patterns in their returns on days following extreme price changes from one trading day to another trading day.

3. Winners’ returns on days following extreme one-day price changes are not substantially explained by size effect.

4. Losers’ returns on days following extreme one-day price changes are not substantially explained by size effect.
5. Winners’ returns on days following extreme one-day price changes are not substantially explained by Value effect.

6. Losers’ returns on days following extreme one-day price changes are not substantially explained by Value effect.

7. Investment strategy of forming a zero-investment portfolio that buys prior losers that have experienced extreme one-day price declines, and sells prior winners that have experienced extreme one-day price rise, generate significant excess returns over few days following one-day price changes.

8. Prior winners display predictable patterns in their returns during hours following extreme price changes within a trading day.

9. Prior Losers display predictable patterns in their returns on days following extreme price changes within a trading day.

10. Winners’ returns during hours following extreme intra-day price changes are not substantially explained by size effect.

11. Losers’ returns during hours following extreme intra-day price changes are not substantially explained by size effect.

12. Winners’ returns during hours following extreme intra-day price changes are not substantially explained by Value effect.

13. Losers’ returns during hours following extreme intra-day price changes are not substantially explained by Value effect.

14. Investment strategy of forming a zero-investment portfolio that buys prior losers that have experienced extreme one-day price declines, and sells prior winners that have experienced extreme one-day price
rise, generate significant excess returns over few days following one-day price changes.

### 1.6 Data and Data Sources

The sample for the purpose of this study consists of stocks forming part of S&P CNX 500 Equity Index. The S&P CNX 500 Equity index is India’s first broad-based stock market index of the Indian stock market that represents about 96% of total market capitalization and about 93% of the total turnover on the National Stock Exchange of India (NSE). The sample is a fair representative of the market performance as the industry weightages in the index mirror the industry weightages in the market. Also, the sample belongs to the 72 industries of the economy, hence representing a broad spectrum.

To examine the prior return effect over short horizon of few days following extreme one-day price changes, our study covers a total period of five years beginning from 3rd July, 2006 to 30th June, 2011. Over the years, number of stocks in our sample grew from 411 stocks in 2006 to 500 stocks in year 2010, depending upon continuous availability of data. The basic data of daily closing adjusted share prices of all the stocks in the sample for a period of five years has been extracted from Prowess, a database offered by Centre for Monitoring Indian Economy (CMIE). PROWESS is financial software widely used in research studies in India. For the investigation of prior return effect over very short horizon of few hours after an event of large intra-day price changes, we have considered the intra-day share prices at interval of 30 minutes each during a period of one year beginning from 4th January, 2010 to 31st December, 2010 and for this purpose, the intra-day share price data has been obtained from database offered by Bloomberg Professional service.

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5 S&P CNX 500 is an index comprised of 500 equity securities which are traded on National Stock Exchange (NSE)
6 Share prices are already adjusted for right issue, bonus issue and stock splits by Prowess
Bloomberg. For the purpose of investigation, the adjusted share prices have been converted into simple percentage returns using the following equation:

\[ R_t = \frac{(P_t - P_{t-1})}{P_{t-1}} \]  

(1.2)

where, \( R_t \) refers to the return on stock \( i \) in period \( t \); \( P_t \) is the price of stock \( i \) in period \( t \); and \( P_{t-1} \) is the price of stock \( i \) in period \( t-1 \).

To investigate the impact of firm’s size and value in explaining its subsequent price behaviour, we have chosen to make use of constituent firm’s market capitalization (defined as a product of number of shares outstanding and market price per share) as a proxy for firm’s size and book value to market value ratio as proxy for firm’s value, as observed during the event of extreme price change, and the data for the same has also been obtained from prowess.

Daily and intra-day return on S&P CNX Nifty\(^7\) Index for the corresponding period has been used as a proxy for the return on market index. It is a well diversified 50 stocks Index that covers 22 sectors of the Indian economy and represents about 67.27% of the free float market capitalization of the stocks listed at NSE (as on September 30, 2012), accurately reflecting the overall market conditions. It is considered as a benchmark index for the Indian equity market. This, in addition to the fact of its continuous availability since 1996, makes it suitable for being used as a market proxy.

The daily and intra-day equivalent of annual interest rates on 91-day Treasury bills has been used as a proxy for risk-free rate of return and the

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\(^7\) S&P CNX Nifty is a free float market capitalization weighted index comprised of 50 equity securities which are traded on National Stock Exchange (NSE)
data for the same has been obtained from the official website of Reserve Bank of India, i.e. www.rbi.org.in.

1.7 Research Methodology

The basic idea behind the investigation of prior return effect in very short term is to examine the possibility that when the stock market is faced with some unanticipated new information pertinent to the value of stock (referred to as ‘event’), stock prices deviate systematically from their fundamental values, or alternatively they do not adjust rapidly to their new fundamental values such that by using the information available in their past prices and returns (specifically at the time of event), their short-term future direction could be predicted. As stated by Atkins and Dyl (1990), an extremely large change in the price of a common stock during a single trading day is most likely caused by unanticipated new information pertinent to the value of stock. Accordingly, for the purpose of our study, we focus on stocks that have shown extreme price movements and consequently the extreme market adjusted excess returns in either direction for a day and during a day. Having identified such stocks, we form two portfolios, one for the winners that have experienced extreme rise in their prices and another for the losers that have experienced an extreme decline in their prices. The empirical testing procedures used to test and verify the prior return effect in stock prices are primarily based upon a design of event study methodology originally proposed by Beaver and Landsman (1981) in the context of testing the semistrong form of market efficiency. The tests used in this study are aimed at assessing the extent and behaviour of systematic nonzero residual stock returns after portfolio formation \((t > 0)\) in relation with systematic residual returns at time \(t = 0\). For this purpose, we analyse the portfolios average abnormal returns, cumulative average abnormal returns as well as their
holding period returns subsequent to the event of extreme price changes over
the trading days as well as within a trading day.

We also examine whether the extent and the direction of the market’s
abnormal reaction to extreme price changes are explained by any stock
market anomalies based on stock characteristics, more specifically the firm’s
size and the value. For this purpose, we run the multi-variate regression to
test the influence of the abnormal event return (AR), the log of firm size
(MCAP), and the log of firm’s Book value to market value ratio (BTM) on post
event Buy-and-Hold average abnormal returns calculated for five different
holding periods, each tested separately to investigate the impact of these
variables on different holding period returns. Firm’s market capitalization
defined as product of number of shares outstanding and the market price per
share at the time of event has been used as size variable. We control for firm’s
size (market capitalization) to investigate whether the observed behaviour of
security returns subsequent to extreme price changes is captured by the risk
related explanation based on size effect. Also, value effect and the
overreaction effect both seem to capture the similar sub-optimal behaviour of
typical investors. Thus, we also verify whether the observed overreaction
effect is another manifestation of value effect or it is a phenomenon distinct
from it. For this purpose, we employ firm’s BTM at the time of event as a
primary value variable. Further, De Bondt and Thaler(1985) has documented
that the most extreme initial winners and losers exhibit the most extreme
subsequent price reversals, which Brown and Harlow (1988) call as
“Magnitude Effect”. We also investigate if the magnitude of subsequent
returns is related to the magnitudes of initial gains or losses caused by event
of extreme price change. Thus we take abnormal event return (AR) as one of
the independent variables.
We also aim to test the possibility of implementing a trading strategy, based on the observed market behaviour following price shocks, which can beat the market on consistent basis. For this purpose, we form a zero-investment portfolio, which buys the negative event securities and short sells the positive event securities on each of the five trading days after the event of extreme price change from one trading day to another trading day and at each of the five consecutive ticks (of 30 minutes each) after the event of extreme price change, observed at 9:15 a.m. daily and 12:15 a.m. daily, with respect to previous tick. Due to short-selling restricted to only one trading day in Indian stock market, we restrict the holding period to one trading day only and thus we considered the average returns of our event losers and winners measured individually for five subsequent days and five subsequent ticks. To examine if our trading strategy of buying losers and short-selling winners with a holding period of one day earns returns in excess of risk premium offered by the market, we run a regression model in which we regress the market return in excess of the risk-free return on our average returns generated by negative event securities net of average returns generated by positive event securities for each of five subsequent periods examined. Further, a detailed discussion of the research methodology employed for the purpose of our above stated investigations has been provided in Chapter four of this study.

1.8 Organisation of the Study

The present study is made up of nine chapters in all, including the present one. Chapter two describes the conceptual framework on the prior-return effect, followed by Chapter three which gives an extensive review of the related literature. Data and the research methodology form the content of Chapter four. Empirical results are presented in Chapters five through eight. Finally, Chapter nine concludes the study, followed by the contributions of
the study, limitations of the study and scope for further research. Relevant Appendices have also been furnished at the end.